

# PATENT ABSTRACTS OF JAPAN

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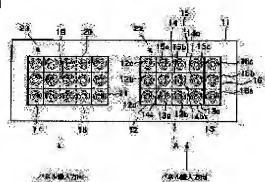
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(54) DISPLAY PANEL HEATING AND EXHAUSTING DEVICE, AND ITS METHOD

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide heating and exhausting device for the display panel which can attempt to miniaturize itself and to enable price reduction without using a large amount of heat-insulating materials.

**SOLUTION:** Far infrared ray ceramic heater groups 12 through 16 are disposed in a place opposite to a panel surface. The respective far-infrared ceramic heater groups are of three far-infrared ceramic heaters. Heating control by a control part is done for each far-infrared ceramic heater group. At this time, the far-infrared ceramic heater group 15 is heated up to roughly 360°C, the central far-infrared ceramic heater group 14 is heated up to roughly 340°C, and the far-infrared ceramic heater groups 12, 13 and 16 are heated up to roughly 380°C.



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CLAIMS

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[Claim(s)]

[Claim 1] In the display-panel heating exhauster which heats a panel and exhausts the interior of a panel in the manufacture process of a flat-surface display The exhaust air means which exhausts said interior of a panel through the exhaust port of said panel, Two or more far-infrared ceramic heaters prepared at intervals of predetermined on the predetermined flat surface countered and located in said panel side, For each far-infrared ceramic heater of every with a thermometry means to measure the temperature of the predetermined part near [ said ] the far-infrared ceramic heater Or the display-panel heating exhauster which has the control means which controls heating by said two or more far-infrared ceramic heaters by two or more control units which consist of two or more far-infrared ceramic heaters, respectively based on said measured temperature.

[Claim 2] Said control means is a display-panel heating exhauster according to claim 1 controlled so that the temperature of said far-infrared ceramic heater countered and located near the core of said panel side becomes low compared with the temperature of said far-infrared ceramic heater countered and located near the periphery of said panel side.

[Claim 3] Said thermometry means is a display-panel heating exhauster according to claim 1 which measures the temperature near [ which is countered and located near the core of said panel side / said ] the far-infrared ceramic heater.

[Claim 4] It is the display-panel heating exhauster according to claim 1 which has said 15 far-infrared ceramic heaters, and controls by said control means making one unit three far-infrared ceramic heaters arranged at the single tier.

[Claim 5] In the display-panel heating exhaust air approach which heats a panel and exhausts the interior of a panel in the manufacture process of a flat-surface display Heating by two or more far-infrared ceramic heaters prepared at intervals of predetermined on the predetermined flat surface countered and located in said panel side for each far-infrared ceramic heater of every Or per two or more control which consists of two or more far-infrared ceramic heaters, respectively The display-panel heating exhaust air approach which performs the exhaust air in said panel, measures the temperature of the predetermined part near [ said ] the far-infrared ceramic heater, and feeds back said measured temperature to said heating control while controlling.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the display-panel heating exhauster which heats and exhausts the gas in a panel, and its approach in the production process of displays, such as PDP and PALC.

[0002]

[Description of the Prior Art] It exhausts in the production process of displays, such as PDP (Plasma Display Panel) and PALC (Plasma Address Liquid Crystal), carrying out vacuum suction of the gas in a panel through the exhaust air hole and exhaust pipe which were formed in the panel. At this time, since the exhaust air hole formed in the panel is small and the conductance in a panel is very small, it is difficult to perform exhaust air completely. Therefore, the display-panel heating exhauster is raising exhaust air effectiveness by exhausting heating the inside of a panel. In order to exhaust the gas in a panel efficiently in such a display-panel heating exhauster, it is important to equalize the temperature of a panel.

[0003] Drawing 5 is an example of the conventional display-panel heating exhauster. In the conventional display-panel heating exhauster 1 shown in drawing 5, the panel 4 is carried in inside the heat insulating material 2 arranged in a furnace, and the exhaust pipe 3 is attached in exhaust air hole 4a of a panel 4. Moreover, the heater 5 and the blower 6 are arranged, by the wind from the air blower 6, inside heat insulating material 2, the air heated at the heater 5 serves as hot blast, a panel 4 is sprayed, and a panel 4 is heated.

[0004] Drawing 6 is the example of others of the conventional display-panel heating exhauster. In the conventional display-panel heating exhauster 7 shown in drawing 6, the panel 4 is carried in inside the heat insulating material 2 arranged in a furnace, and the exhaust pipe 3 is attached in exhaust air hole 4a of a panel 4. Moreover, inside heat insulating material 2, two or more heaters 8 are arranged so that it may be approached and located in the front face of a panel 4.

[0005]

[Problem(s) to be Solved by the Invention] However, in the conventional display-panel heating exhausters 1 and 7 shown in drawing 5 mentioned above and drawing 6, in order to carry out indirect heating of the inside of a panel 4, a lot of heat insulating material 2 and 9 is needed heating the air in a furnace at a heater. Moreover, in the display-panel heating exhauster 1, in order to spray hot blast on a panel 4 at homogeneity, it is necessary to maintain the distance of a heater 5 and the air blower 6, and a panel 4 more than fixed. Consequently, enlargement, complication, and the problem of forming an expensive rank have a furnace.

[0006] This invention is made in view of the conventional technique mentioned above, and aims at offering the display-panel heating exhauster which can attain simplification and low-pricing of small-scale-izing and a configuration, and its approach, without using a lot of heat insulating material.

[0007]

[Means for Solving the Problem] Solve, and in order to attain the purpose which mentioned above the

trouble of the conventional technique mentioned above, the display-panel heating exhauster of this invention The exhaust air means which is the display-panel heating exhauster which heats a panel and exhausts the interior of a panel in the manufacture process of a flat-surface display, and exhausts said interior of a panel through the exhaust port of said panel, Two or more far-infrared ceramic heaters prepared at intervals of predetermined on the predetermined flat surface countered and located in said panel side, For each far-infrared ceramic heater of every with a thermometry means to measure the temperature of the predetermined part near [ said ] the far-infrared ceramic heater Or it has the control means which controls heating by said two or more far-infrared ceramic heaters by two or more control units which consist of two or more far-infrared ceramic heaters, respectively based on said measured temperature.

[0008] With the display-panel heating exhauster of this invention, heating by two or more far-infrared ceramic heaters is controlled by the control means. At this time, heating control of a far-infrared ceramic heater is performed per two or more control which consists of each far-infrared ceramic heater of every and two or more far-infrared ceramic heaters, respectively. Consequently, according to experimental data, a heating pattern can be set up flexibly. Moreover, a far-infrared ceramic heater heats a panel directly with the radiant heat of the infrared radiation emitted from a ceramic plate by heating at a heater.

[0009]

[Embodiment of the Invention] Hereafter, the display-panel heating exhauster concerning the operation gestalt of this invention and its approach are explained. The top view of the display-panel heating exhauster 11 concerning this operation gestalt in drawing 1 and drawing 2 are the side elevations of the display-panel heating exhauster 11 seen from the direction of the arrow head A shown in drawing 1. The display-panel heating exhauster 11 is used in the process in which PDP for example, whose screen GAIJU is 25 inches of 9 (length)x16 (width) is manufactured. As shown in drawing 1 and drawing 2, the display-panel heating exhauster 11 is equipped with heating furnaces 22 and 23.

[0010] A heating furnace 22 has five far-infrared ceramic heater groups 12-16 arranged by the pattern as shown in drawing 1. The heating furnace 23 is fundamentally the same as a heating furnace 22, and has five far-infrared ceramic heater groups 17-21. The far-infrared ceramic heater groups 12-16 have three far-infrared ceramic heaters 12a, 12b, and 12c arranged at the single tier, respectively, ..., 16a, 16b and 16c. Three far-infrared ceramic heaters contained in each of the far-infrared ceramic heater groups 12-16 are controlled by the same control signal. That is, the far-infrared ceramic heater contained in the same heater group generates heat at the same temperature.

[0011] Far-infrared ceramic heater 12a has composition which has arranged the ceramic plate 12a2 to the radial plane side of a heater 12a1, as shown in drawing 2. Far-infrared ceramic heater 12a heats a ceramic plate 12a2 at a heater 12a1, and heats a panel 4 directly with the radiant heat of the infrared radiation emitted from a ceramic plate 12a2 by this heating. In addition, generally, a far-infrared ceramic heater can be excellent in a controllability, and can be driven by low power. The configuration of other far-infrared ceramic heaters with which the display-panel heating exhauster 11 was equipped is the same as the far-infrared ceramic heater 12. As shown in drawing 2, inside a heating furnace 22, a panel 4 is carried in by the carrying-in equipment which is not illustrated, and an exhaust pipe 3 is attached in exhaust air hole 4a of a panel 4.

[0012] Moreover, as shown in drawing 3, the display-panel heating exhauster 11 has a control section 30, the thermometry section 31, and memory 32. The thermometry section 31 approaches the far-infrared ceramic heater group 15 shown in drawing 1, is arranged, measures the temperature of the neighborhood, and outputs the measurement result S31 to a control section 30. Memory 32 memorizes the control program which a control section 30 uses.

[0013] A control section 30 generates control signals S12-S21 according to the control program memorized by memory 32 using the measurement result S31 from the thermometry section 31, and outputs these to the far-infrared ceramic heater groups 12-21. Here, a control section 30 generates control signals S12-S21 so that the far-infrared ceramic heater groups 14 and 19 may be heated weakness and it may make slight strength heat the far-infrared ceramic heater groups 12, 13, 16, 17, 18,

and 21 compared with the far-infrared ceramic heater groups 15 and 20. Thus, it is checked by experiment that it is suitable to generate control signals S12-S21 to equalize the temperature of a panel 4.

[0014] For example, in heating a panel front face at 280 degrees C, it generates control signals S12-S21 so that the temperature of each heater of the central far-infrared ceramic heater groups 14 and 19 may be saved at about 340 degrees C, the temperature of each heater of the far-infrared ceramic heater groups 15 and 20 may be saved at about 360 degrees C and the temperature of each heater of the far-infrared ceramic heater groups 12, 13, 16, 17, 18, and 21 may be saved at about 380 degrees C. Here, the temperature of the far-infrared ceramic heater groups 13 and 18 is more highly set up for suppressing a temperature fall near carrying-in opening of a panel 4.

[0015] Hereafter, the exhaust air processing in the heating furnace 22 of the display-panel heating exhauster 11 is explained. In addition, the exhaust air processing in a heating furnace 23 is fundamentally [ as a heating furnace 22 ] the same. First, a panel 4 is carried in in a heating furnace 22. And an exhaust pipe 3 is attached in exhaust air hole 4a of a panel 4.

[0016] Next, based on the measurement result S31 from the thermometry section 31 arranged by approaching the far-infrared ceramic heater group 15, control signals S12-S21 are generated in a control section 30. At this time, according to the control program memorized by memory 32, the measurement temperature of the thermometry section 31 becomes like the continuous line 41 shown in drawing 4 in time, and a control section 30 generates a control signal S14 so that the skin temperature of a panel 4 may change according to the dotted line 40 shown in drawing 4 in time. Here, the keeping temperature of the far-infrared ceramic heater group 14 is 340 degrees C. In addition, as the temperature of the far-infrared ceramic heater group 15 is shown in drawing 4, it is determined that the front face of a panel 4 will have overshoot 42 to the keeping temperature of 280 degrees C. Also about other control signals, in a control section 30, it is generated so that the far-infrared ceramic heater group which corresponds, respectively may be saved to the predetermined temperature according to a control program.

[0017] As explained above, since a panel 4 is directly heated with the radiant heat of the infrared radiation from a far-infrared ceramic heater, according to the display-panel heating exhauster 11, the amount of the heat insulating material which it becomes unnecessary to keep the inside of a heating furnace overall to the temperature of homogeneity like before, and is needed is sharply reducible. Moreover, izing of the scale in a heating furnace can be carried out [ \*\*\*\* ]. Consequently, it can be made simplicity and a small-scale and low price equipment configuration. According to the display-panel heating exhauster 11, the scale of a heating furnace can be set to about  $1/2 - 1/3$  compared with the former, and, specifically, an equipment price can be set to  $1/2 - 1/4$  compared with the former. Moreover, according to the display-panel heating exhauster 11, compared with the former, power consumption can be set to  $1/4 - 1/5$  by using the far-infrared ceramic heater of low power.

[0018] Moreover, according to the display-panel heating exhauster 11, based on an experimental result, two or more far-infrared ceramic heaters can be divided into two or more heater groups, and a panel 4 can be heated to the temperature of homogeneity by controlling heating for every heater group of these.

[0019] This invention is not limited to the operation gestalt mentioned above. For example, although it was made a configuration which is equipped with two heating furnaces 22 and 23, and controls ten far-infrared ceramic heater groups by the control section 30 with the operation gestalt mentioned above, this invention may be made a configuration which is equipped only with a heating furnace 22.

[0020] Moreover, although the thermometry section 31 is formed only near the far-infrared ceramic heater group 14 and it was made to control all the other far-infrared ceramic heater groups by the operation gestalt mentioned above using this measurement result, you may make it this invention prepare the thermometry section near [ each ] each far-infrared ceramic heater group.

[0021] Moreover, this invention can be used also for the manufacture process of PDP or PALC of other sizes although illustrated with the operation gestalt mentioned above about the display-panel heating exhauster 11 used for the manufacture process of 25 inches PDP. Then according to panel size, arrangement of a far-infrared ceramic heater is set up appropriately.

[0022]

[Effect of the Invention] As explained above, according to the display-panel heating exhauster of this invention, and its approach, the amount of the heat insulating material which it becomes unnecessary to keep the inside of a heating furnace overall to the temperature of homogeneity, and is needed is sharply reducible. Moreover, -izing of the scale in a heating furnace can be carried out [ \*\*\*\* ]. Consequently, it can be made simplicity and a small-scale and low price equipment configuration. Moreover, according to the display-panel heating exhauster of this invention, and its approach, compared with the former, power consumption is reducible by using the far-infrared ceramic heater of low power. Furthermore, according to the display-panel heating exhauster of this invention, and its approach, based on an experimental result, two or more far-infrared ceramic heaters can be divided into two or more heater groups, and a panel can be heated to the temperature of homogeneity by controlling heating for every heater group of these.

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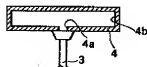
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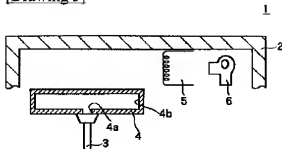
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## DRAWINGS

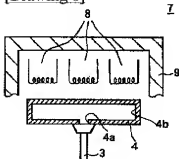
[Drawing 2]



[Drawing 5]

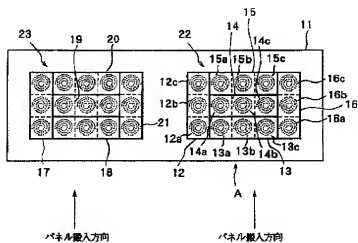


[Drawing 6]

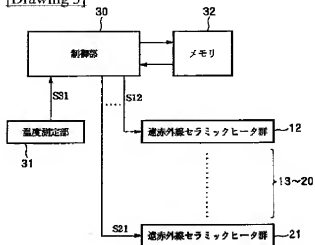


[Drawing 1]

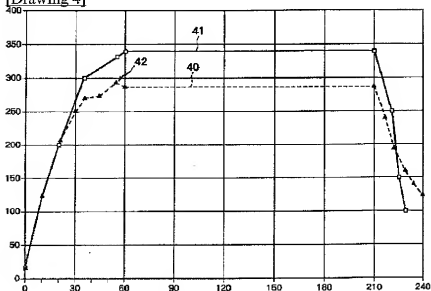




[Drawing 3]



[Drawing 4]



[Translation done.]